
**COMMONWEALTH OF PUERTO RICO
PUERTO RICO ENERGY COMMISSION**

IN RE: REVIEW OF RATES OF THE PUERTO RICO
ELECTRIC POWER AUTHORITY

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SUBJECT: EXPERT REPORT: RATE MECHANISM,
RECONCILIATION OF PROVISIONAL RATES,
ENERGY EFFICIENCY RIDER

EXPERT REPORT

OF

Tim Woolf

**Synapse Energy Economics
485 Massachusetts Avenue
Cambridge, MA 02139**

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1. Mechanism for Setting PREPA's Rates

1.1 Rate Mechanisms

The term “rate mechanism” is used here to refer generally to the set of regulatory practices for setting a regulated utility’s rates over time. Rate mechanisms include many different elements, such as how frequently a utility files a rate case; whether the rate case is based on historical costs or future costs; whether base rates can be adjusted between rate cases; whether cost trackers can be used; whether reconciling riders can be used; and more.

In general, rate mechanisms are designed to achieve several important goals, such as timely and predictable recovery of reasonable utility costs; financial incentives for the utility to plan and operate its system efficiently; rigorous oversight by the regulatory commission; the ability for the commission to preclude the recovery of costs that are not reasonable and prudent; meaningful input from consumer advocates and other stakeholders; and the provision of just and reasonable rates to customers.

Commissions throughout the United States utilize a wide variety of rate mechanisms. These generally fall with three categories: traditional cost-of-service ratemaking (COSR); performance-based ratemaking (PBR); and formula ratemaking.

These three categories are somewhat misleading because states use so many variations and permutations of ratemaking elements that the lines between these categories, particularly between COSR and PBR, have become blurred.¹ Furthermore, states modify elements of their ratemaking mechanisms over time, and some states are considering alternatives to current ratemaking mechanisms in order to address evolving developments in the electricity industry.² A relatively small number of states apply formula ratemaking to electric utilities.³

The rate mechanisms used by regulators in other jurisdictions are typically applied to investor-owned utilities. Many different elements of the rate mechanisms are designed to provide investor-owned utilities with financial incentives to achieve regulatory goals—financial incentives that generally apply to the utility shareholders.

As a publicly-owned utility, Puerto Rico Electric Power Authority (PREPA) does not have shareholders. Consequently, most of the rate mechanisms that are used in other jurisdictions have limited application and significantly different implications in Puerto Rico.

There are several additional ways that PREPA differs from regulated utilities in other jurisdictions. This is PREPA’s first rate case under the Commission. PREPA enters this rate case with severe financial constraints, and it needs to recover sufficient revenues in a timely way to cover its costs. PREPA has a history of poor performance and an ongoing need for significant

¹ Whited, M. and T. Woolf. 2015. *Utility Performance Incentive Mechanisms: a Handbook for Regulators*. Prepared for the Western Interstate Energy Board. March 2015. <http://www.synapse-energy.com/project/performance-incentives-utilities>

² Lowry, M. and T. Woolf. 2016. *Performance-Based Regulation in a High Distributed Energy Resources Future*. Lawrence Berkeley National Laboratory, Future Electric Regulation Series, January 2016. <https://emp.lbl.gov/future-electric-utility-regulation-series>

³ Hemphill Direct Testimony, Figure 10, Exhibit 7.02.

improvement in its operations and services.⁴ PREPA has high electricity rates, as well as an aging infrastructure in need of upgrading. All of these factors indicate that the rate mechanisms used in other jurisdictions may not be suitable for a publicly-owned utility such as PREPA.

1.2 Criteria for Determining the Rate Mechanism in Puerto Rico

I recommend that the Commission apply the following criteria to evaluate the rate mechanism options for PREPA:

1. Maintain or improve PREPA's financial stability.
2. Provide PREPA with timely and predictable recovery of costs.
3. Allow for that level of Commission oversight of PREPA's activities and expenditures sufficient to prevent PREPA from incurring imprudent costs.
4. Allow for involvement by parties representing customers and other perspectives, sufficient to help the Commission carry out its duties.
5. Promote transparency in the ratemaking process by enabling the Commission to review all information relevant to PREPA's budget forecasting and operational and capital expenditures.
6. Induce PREPA to improve its performance.
7. Result in just and reasonable rates.

1.3 Key Issues in Determining a Rate Mechanism

Below I provide a summary of the key issues that the Commission should address in determining a rate mechanism for PREPA. This list includes issues that must be addressed in any rate mechanism, as well as issues specific to PREPA at this time.

Frequency of rate cases. Does PREPA have the right to choose when to apply for a rate case, or is PREPA instead required to apply at pre-determined times? If there is a pre-determined time interval between rate cases, is it reasonable?

Historical or future data. Should revenue requirements be based on data from historical test years, which only include actual costs incurred plus known and measurable changes? Or should revenue requirements be based on data from future test years, using forecasts of future costs?

Adjustment of rates between rate cases. Should rates be adjusted in any way between rate cases? Should base rates be adjusted? Should PREPA be allowed to use cost trackers? Should PREPA be allowed to use reconciling riders to recover costs?

Cost reconciliation. Should the rate mechanism allow PREPA to reconcile projected costs to actual costs? How and when should PREPA perform the reconciliation?

Sales reconciliation. Should the mechanism allow PREPA to reconcile projected sales to actual sales? How and when should PREPA perform the reconciliation?

⁴ See, for example, Act 57-2014, Statement of Motives.

Commission oversight. To what extent should the Commission review information, make findings, and modify rates during and between rate cases?

Commission approval of budgets. Should the Commission review, modify, and approve budget forecasts? What are the implications of Commission approval of expenditures before they are incurred? What are the implications of rejecting expenditures before they are incurred?

Recovery of costs. How can PREPA be held accountable to its budget forecasts? What happens if PREPA exceeds the budget forecasts? Will the Commission be able to disallow incurred costs that are in excess of the budget forecast? Will the Commission have legal authority, and the practical ability, to disallow those already-incurred costs that it finds are imprudent? What actions must PREPA take, regarding prospective spending, when the Commission disallows an already-incurred cost?

Customer protections. Does the rate mechanism provide sufficient customer protection from poor performance, inefficient practices, erroneous cost projections (both projections that are inflated and projections that are too low), or cost-overruns?

Current conditions. Does the rate mechanism account for current conditions facing PREPA? Does it account for PREPA's severe financial constraints, history of poor performance, high electric rates, and need to address aging infrastructure?

1.4 PREPA's Proposed Rate Mechanism

PREPA is proposing to utilize a Formula Rate Mechanism (FRM), as described by witness Hemphill in his direct testimony, supplemental testimony, and additional supplemental testimony. PREPA's Witness Hemphill notes that formula rates are used in two states to regulate electricity utilities, in three states to regulate gas utilities, and in two states to regulate electric and gas utilities.⁵ He also notes that formula rates are used by the Federal Energy Regulatory Commission to set transmission rates.⁶

Witness Hemphill states that the FRM uses the same approach to calculate revenue requirements as traditional ratemaking. FRM also does not require any different revenue allocation or rate design practices than what is used under traditional ratemaking.⁷

The primary difference between FRM and traditional ratemaking is the way that historical (i.e., previously incurred) utility costs are treated. Under traditional ratemaking mechanisms (including COSR and PBR), any over- or under-recovery of historical costs is absorbed by the utility. Under formula rate mechanisms (including PREPA's proposed FRM) any over- or under-recovery of historical costs is reconciled and returned to the utility. In other words, under PREPA's proposed FRM, PREPA would be allowed to recover every dollar that it spends.

The key elements of PREPA's proposed FRM are described below.

Frequency of rate cases. PREPA proposes to have a rate case every three years. These rate cases would be entirely consistent with a traditional rate case, during which the revenue requirements

⁵ Hemphill Direct Testimony, Figure 10, PREPA Exhibit 7.02.

⁶ Hemphill Direct Testimony, p. 9, lines 199-203.

⁷ Throughout this report, I use the term "revenue allocation" to mean "cost allocation," as the latter term is used by Witness Hemphill and PREPA.

are set based upon up-to-date information, costs are allocated using an up-to-date cost-of-service study, and rates are designed using the Commission's then-current rate design goals.⁸

Interim rate cases. PREPA proposes to also have interim rate cases in those years between the full rate cases. In these interim rate cases the revenue requirements, and thus the rates, would be adjusted to reconcile the costs from the past year and create new budgets for the next year. The new budgets for the next year would be based on both an updated budget forecast and an updated sales forecast for the next year. No adjustments for revenue allocation or rate design purposes would occur in the interim rate cases.

Historical or future data. PREPA proposes to use budget forecasts to set revenue requirements, in both the three-year and the interim rate cases. The budget forecasts would be divided by the sales forecasts to determine rates for the forthcoming year.

Other inputs to rate cases. PREPA proposes that the information and findings from the most recent integrated resource plan (IRP) docket will inform the capital expenditure forecasts in each full rate case and interim rate case.

Cost and sales reconciliation. PREPA proposes that the Commission fully reconcile the revenues for the most recent historical year. Any differences between the budget forecast and the actual costs for the most recent year would be reconciled (i.e., trued up). Similarly, any differences between the sales forecast and the actual sales for the most recent year would be reconciled. In this way, PREPA would be assured of recovering every dollar that it spends.

Commission oversight. PREPA proposes that each full rate case and interim rate case include an adjudicated proceeding in which the Commission and other intervenors will be able to review, critique, modify, or accept (a) the historical reconciliations and (b) the forecast of next year's budgets and sales. PREPA notes that in all rate cases the Commission will have the full authority and flexibility allowed by law to investigate, analyze, and make findings on PREPA's filings. In other words, no aspect of its proposal limits the Commission's oversight in either the full or the interim rate cases.

Recovery of incurred costs. Witness Hemphill claims that the Commission will have the flexibility to disallow costs that it finds to be imprudent.⁹ However, Witness Hemphill states that disallowing costs that have already been incurred by PREPA might not be advisable, because the "disallowance of costs means that dollar-for-dollar PREPA will have to cut or defer expenditure. This is counter-productive to PREPA's transformation and ability to provide good service to customers."¹⁰

Customer protections. Witness Hemphill claims that PREPA's proposed FRM "sets rates precisely so customers pay no more or no less than PREPA's actual costs, while simultaneously providing for increased Commission oversight of PREPA's business planning process."¹¹ Witness Hemphill lists six objectives of his proposal, several of which imply protections for customers:

⁸ Throughout this report, I use the term "three-year rate case" to refer to these full rate cases, and the term "interim rate case" to refer to the cases that occur between the three-year rate cases.

⁹ Hemphill Supplemental, pp. 3-4, lines 62-65; p.5, lines 98-103; p. 9, lines 190-193. Hemphill Additional Supplemental, p. 2, lines 32-35; p. 3, lines 52-55; p. 4, lines 65-68; p. 5, lines 97-101.

¹⁰ Hemphill Supplemental, p. 10, lines 199-201. Hemphill Additional Supplemental, p. 2, lines 35-37, p. 5, lines 102-103.

¹¹ Hemphill Supplemental, p. 3, lines 52-54.

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1. the FRM should “keep PREPA on track with a business plan that produces real cost savings”;
 2. the FRM should “work symmetrically to address over-recoveries and under-recoveries... so the overall mechanism is fair to both PREPA and its customers”;
 3. the FRM should provide “the Commission a substantial and well-defined role in reviewing PREPA’s forward-looking investment plans and budgets”;
 4. the FRM should “mitigate risks to PREPA and its customers” regarding financial uncertainties;
 5. the FRM “must demonstrate overall benefits to customers in terms of increased transparency, stability in annual rate changes, and increases in service quality”;
and
 6. the FRM should separate the process of setting revenue requirements from “questions of rate design and policy.”¹²

Witness Hemphill emphasizes cost control as a means of protecting customers. He states: “A primary goal of the FRM is to allow the Commission to track PREPA’s progress in meeting the goals set in each annual business plan. This is where the greatest opportunity for the Commission to impact cost control exists... The FRM embodies strong prospective oversight, and makes it a feature of a regular annual process.”¹³

Current conditions. Witness Hemphill claims that the FRM is appropriate under the current conditions, because “PREPA is in a rebuilding phase, and this approach best ensures that PREPA will stay on track to become a financially viable utility that provides quality service.”¹⁴ Witness Hemphill states that the FRM is appropriate at this time because “PREPA’s financial situation is precarious, and it has no real reserve or reasonable ability to borrow or access equity markets... Thus, it cannot absorb any regulatory lag – or unforeseen cost – without the real possibility that it must defer investment or go off-track in its Business Plan.”¹⁵

Filing requirements. PREPA proposes an annual cycle for filing, reviewing, and issuing orders for the interim rate cases and the full rate cases.¹⁶ Each year PREPA will file either a full rate request or an interim rate case request in October. The Commission will have until March 30th of that year to conclude the proceeding. New rates reflecting the Commission order will go into effect July 1st of that year. Witness Hemphill provides a table and a graphic depiction of the next several rate cases in his Supplemental Testimony.¹⁷

Adjustment to rates. PREPA proposes that revenue requirement updates be applied to both fixed and volumetric charges. Witness Hemphill states that any “revenue requirement updates and the effect of the reconciliation will be implemented across-the-board through equal percentage adjustments in base rates. Thus, each 1% decrease in the revenue requirement will cause a 1% decrease in all base rate charges (volumetric and non-volumetric).”¹⁸

¹² This list is from Hemphill Supplemental, pp. 3-4, lines 64-85.

¹³ Hemphill Additional Supplemental Testimony, p. 2, lines 26-32.

¹⁴ Hemphill Direct Testimony, p. 4, lines 83-85.

¹⁵ Hemphill Direct Testimony, p. 5, lines 101-106.

¹⁶ Hemphill Supplemental Testimony, p. 10, lines 206-208.

¹⁷ Hemphill Supplemental Testimony, p. 10, lines 206-208, and PREPA Ex. 16.01.

¹⁸ Hemphill Supplemental Testimony, p. 6, lines 109-112.

1.5 Intervenor Testimony on the Rate Mechanism

Witnesses Tom Sanzillo and Kathy Kunkle submitted testimony in this docket on behalf of the Institute for Competitiveness and Sustainable Economy (ICSE-PR). Witnesses Sanzillo and Kunkle provided the following conclusions and recommendations regarding PREPA's proposed FRM.

Sanzillo and Kunkle state that PREPA's current context indicates the need for strong regulatory oversight from the Commission.¹⁹ The "logic of traditional rate regulation based on a historical test year will not work well for PREPA under its current circumstances."²⁰

They assert that PREPA's proposal should not be referred to as a formula rate mechanism, because this term "carries the implication of less regulatory oversight and even automatic adjustments to rates according to a formula."²¹ Instead, they recommend that it be referred to as an "annual rate review."²²

Sanzillo and Kunkle agree with Hemphill that PREPA's budget estimates should not automatically be reconciled with actual costs. Instead, the Commission should have the discretion to determine whether costs incurred were imprudent and to disallow those costs found to be imprudent.

However, they point out that ratepayers would eventually bear the impacts of any historical costs that are deemed imprudent. Without shareholders to bear the imprudent costs, PREPA would be forced to compensate by reducing operating or capital expenditures. For this reason, "it is important that PREPA be regulated as closely as possible to minimize imprudent expenditures."²³

When the Commission approves just and reasonable rates for PREPA, it could use the annual rate review to facilitate its strict oversight.²⁴ Sanzillo and Kunkle offer the following additional recommendations²⁵ for improving the Commission's oversight of PREPA's expenditures.

1. The Commission could require more frequent financial updates on major capital expenditures.
2. The Commission could hire its own engineering advisor to oversee PREPA's management of large projects.
3. The Commission could require PREPA to provide a turnkey cost estimate from an engineering procurement and construction (EPC) contractor for major projects.
4. The Commission could appoint an Independent Private Inspector General (IPSIG) to oversee PREPA's budgeting and expenditures.

These measures could be adopted regardless of whether the Commission approves PREPA's proposed FRM or some other rate mechanism.²⁶

¹⁹ Sanzillo/Kunkel Direct Testimony, p. 21, lines 356-358.

²⁰ Sanzillo/Kunkel Direct Testimony, p. 22, lines 403-404.

²¹ Sanzillo/Kunkel Direct Testimony, p. 22, lines 381-382.

²² Sanzillo/Kunkel Direct Testimony, p. 23, line 398.

²³ Sanzillo/Kunkel Direct Testimony, p. 23, lines 428-437.

²⁴ Sanzillo/Kunkel Direct Testimony, p. 27, lines 462-465.

²⁵ Sanzillo/Kunkel Direct Testimony, pp. 26-27, lines 440-456.

²⁶ Sanzillo/Kunkel Direct Testimony, p. 27, line 457.

1.6 Conclusions

The Current Context

There is no question that PREPA is facing extraordinary circumstances as an electric utility. The Company's financial constraints are well-documented in this case and elsewhere. The Company's poor historical performance in many areas—particularly in controlling costs—is also well established.

PREPA's situation poses additional challenges because it is a publicly-owned utility. Without equity shareholders to absorb cost over-runs or imprudent costs, many of the rate mechanism tools used by regulators of investor-owned utilities (IOUs) are irrelevant, meaningless, or will have little effect. Rate mechanisms employed by regulators in other jurisdictions are designed to provide financial incentives to utility management, and ultimately to shareholders. But when applied to a publicly-owned utility these mechanisms may have little or no ability to prevent inefficient or imprudent expenditures or to protect customers if they occur.

I agree with witnesses Hemphill, Sanzillo, and Kunkle that current conditions require strong regulatory oversight from the Commission. I also agree with Sanzillo and Kunkle that the term “formula rate mechanism” does not imply strong regulatory oversight, and it should not be used in this context. I will adopt Sanzillo's and Kunkle's suggestion to use the term “annual rate review” to describe my recommendations for a rate mechanism, because it is more descriptive of what I recommend.

PREPA's Proposal Meets Several Criteria

I conclude that PREPA's proposal meets six of the criteria described above for evaluating a rate mechanism. These include the following criteria.

Maintain or improve financial stability. Annual rate cases, with a reconciliation of the past year's expenditures and a resetting of rates to meet next year's budgets, will provide investors with confidence that PREPA will be able to cover necessary costs and make necessary debt payments.

Provide timely and predictable recovery of costs. Annual rate cases, with a reconciliation of the past year's expenditures and a resetting of rates to meet next year's budgets, will provide PREPA with a high level of assurance that it will be able to recover its costs very close to when the costs are incurred. I know of no other rate mechanism that provides a timelier, more predictable, or more certain recovery of utility expenditures.

Allow for sufficient Commission oversight. Annual rate cases that are fully adjudicated should provide the Commission with significant oversight of PREPA's budgeting and expenditures. According to witness Hemphill, the Commission will have the same full authority and discretion to review interim rate cases that it would have under full rate cases. The one important reservation that I have about meeting this criterion is whether the Commission will have the resources and the expertise to provide the type of oversight needed for all PREPA rate cases.

Allow for sufficient stakeholder involvement. Annual rate cases that are fully adjudicated should provide stakeholders with significant involvement in reviewing PREPA's budgeting and expenditures. The one important reservation that I have about meeting this criterion is whether the stakeholders will have the resources and the expertise to provide the type of involvement needed for all of the PREPA rate cases.

Promote transparency in the ratemaking process. Annual rate cases that are fully adjudicated should allow for transparency in the ratemaking process. According to witness Hemphill, the Commission and intervenors would have access to all the information in the interim rate cases that is typically provided in a full rate case.²⁷ Obtaining this information in its entirety each year would significantly enhance the transparency of the ratemaking process. The one important reservation I have about this criterion is that it depends upon PREPA providing comprehensive, meaningful, audited, and timely information for all the rate cases. In this first rate case, PREPA has not demonstrated that it is capable of meeting this goal.²⁸

PREPA's Proposal Does Not Meet Two Important Criteria

I also conclude that PREPA's proposal fails to meet two important criteria for evaluating a rate mechanism: (a) induce PREPA to improve its performance, and (b) result in just and reasonable rates. Both problems stem from the fact that the Commission may have limited ability to disallow PREPA expenditures that are unreasonable or imprudent.

Witness Hemphill's description of his proposal is internally inconsistent and misleading in this regard. He claims many times over that the Commission can disallow imprudent costs, and that cost disallowance will protect ratepayers from inefficient or excessive costs.²⁹ However, he strongly recommends that the Commission not disallow imprudent costs, due to PREPA's current financial condition.³⁰ Furthermore, he acknowledges that if the Commission does disallow imprudent costs, it would only harm customers. Disallowances would only lead to reductions in needed operating and capital expenditures. In sum, Hemphill claims that the Commission has a powerful tool for controlling costs, and then he claims that the tool should not be used.

If the Commission cannot disallow unreasonable or imprudent costs, PREPA lacks the financial incentive to prepare budget estimates that are as accurate as possible and adhere to those budgets by operating as efficiently as possible. In short, the Commission would not have access to the primary tool that regulators have to induce good performance in investor-owned utilities.

Similarly, if the Commission cannot disallow unreasonable or imprudent costs, customers would be at risk of bearing any such costs that do occur. PREPA's proposed rate mechanism does not meet even witness Hemphill's own objective that it should "work symmetrically to address over-recoveries and under-recoveries... so the overall mechanism is fair to both PREPA and its customers."³¹ A rate mechanism that essentially guarantees recovery of all costs incurred by a utility, and provides little inducement for the utility to optimize its performance, is not symmetrical, does not address over-recoveries, and is at risk of not resulting in just and reasonable rates.

Witness Hemphill does not offer any suggestions for how to make up for this significant omission from his proposal. He did provide additional supplemental testimony in response to the Commission's directive to "provide insight with regards to the FRM's effectiveness as a cost-

²⁷ Hemphill Additional Supplemental Testimony, pp. 6-7, lines 129-132.

²⁸ See the expert report of Jeremy Fisher PhD and Ariel Horowitz PhD, November 21 2016.

²⁹ Hemphill Supplemental, pp. 3-4, lines 62-65; p. 5, lines 98-103; p. 9, lines 190-193. Hemphill Additional Supplemental, p. 2, lines 32-35; p. 3, lines 52-55; p. 4, lines 65-68; p. 5, lines 97-101.

³⁰ Hemphill Supplemental, p.1 0, lines 199-201. Hemphill Additional Supplemental, p. 2, lines 35-37; p. 5, lines 102-103.

³¹ Hemphill Supplemental Direct Testimony, pp. 4-3, lines 62-64.

control measure.”³² However, witness Hemphill’s supplemental direct testimony does not provide any such insight. It simply explained how his FRM proposal was better than other regulatory alternatives, given PREPA’s current conditions.³³

Witness Hemphill’s comparison of his FRM to alternative rate mechanisms does not address the decision facing the Commission in this case. The Commission needs to decide whether the proposed rate mechanism will meet its criteria, described above, and will generally serve the public interest in Puerto Rico. I find that it does not meet the two important criteria of providing PREPA with inducement to improve performance and resulting in just and reasonable rates.

1.7 Recommendations

Adopt the Core Elements of PREPA’s Proposal

I recommend that the Commission adopt the core elements of PREPA’s proposal that Hemphill and I essentially agree on:

1. The rate mechanism should allow for strong regulatory oversight by the Commission.
2. PREPA should file full rate cases at three-year intervals, with interim rate cases each year in between the full rate cases.
3. The Commission will have the discretion to hold full adjudicatory proceedings, with all the relevant due process for intervenors, for both full and interim rate cases.
4. The full rate case and the interim rate cases should be filed with the Commission in October of each year, with the goal of concluding the proceeding by March of the following year and putting rates in place the following July.

These elements should provide the stability, the predictability, the investor confidence, and the revenues necessary for PREPA to transition from historical performance to improved performance expected by the legislature, this Commission, and the public in general.

However, given the problems discussed above with PREPA’s proposal, I recommend that the Commission take further steps to control costs and protect customers. Given the limited ability that the Commission has to provide financial incentives to PREPA as a publicly-owned utility, the Commission should be especially pro-active and vigilant in undertaking all measures available to control costs and protect customers.

Maximize Commission Oversight of the Budgeting Process

I agree with witness Hemphill that “prospective cost control measures” by the Commission provide the best opportunity to affect actual expenditures and avoid unreasonable or imprudent expenditures.³⁴ This means that the Commission should be heavily engaged in the process of establishing budget estimates, and establishing measures to ensure the budgets are not

³² Puerto Rico Energy Commission, Order requiring additional supplemental testimony from witness Hemphill, October 27, 2016, p. 1.

³³ See, for example, Hemphill Additional Supplemental Testimony, pp. 6-7, lines 125-142.

³⁴ Hemphill Additional Supplemental Testimony, p. 2, lines 28-32.

exceeded. This is consistent with Sanzillo and Kunkel’s recommendation that “PREPA be regulated as closely as possible to minimize imprudent expenditures.”³⁵

I recommend that the Commission establish practices to assist PREPA in making budget forecasts that are as accurate, reasonable, and prudent as possible. This includes the following practices:

1. Direct PREPA to improve its bookkeeping, record keeping, and auditing practices to provide PREPA management and the Commission with meaningful, timely, and reliable cost information to be used as input for the budget forecasts.
2. Direct PREPA to provide the Commission with a detailed annual report comparing historical budget forecasts to actual expenditures, along with lessons learned for future forecasting purposes.
3. Direct PREPA to use the most recent, Commission-approved IRP as the basis for the budget forecast.
4. Direct PREPA to provide a turnkey cost estimate or other third-party based estimate for major new capital projects included within the budget forecasts.³⁶

I also recommend that the Commission establish practices that will cause PREPA to comply with Commission orders regarding PREPA budgets. This includes the following practices:

1. Direct PREPA to expand upon its monthly surveillance reporting.³⁷
2. Direct PREPA to conduct management performance and regulatory auditing on major capital projects.³⁸
3. Hire an independent management auditor for major capital projects.³⁹
4. Investigate the role that an Independent Private Sector Inspector General could play in assisting PREPA to remain within estimated budgets.⁴⁰

Expand Commission Oversight of PREPA’s Performance

On November 15, 2016 the Commission issued a Notice of Investigation to identify opportunities to improve PREPA’s performance.⁴¹ The investigation will include two tracks. One track will include one or more independent audits of PREPA’s performance issues. Another track will include a rulemaking process under which the Commission will prepare proposed rules to guide the Commission oversight of PREPA’s performance. The Notice of Investigation indicates that the performance proceeding could be quite broad, addressing performance in the areas of

³⁵ Sanzillo/Kunkel Direct Testimony, p. 25, lines 436-437.

³⁶ Major capital projects could be defined, for example, as those whose budgets exceed a pre-determined amount or a pre-determined percent of total capital budgets.

³⁷ See Expert Report of Larkin Associates, Section VI-A.

³⁸ See Expert Report of Larkin Associates, Section VI-B.

³⁹ See Expert Report of Larkin Associates, Section VI-C.

⁴⁰ See Sanzillo/Kunkel Direct Testimony, p. 27, lines 455-456.

⁴¹ Puerto Rico Energy Commission, *Notice of Investigation to Identify Opportunities to Improve Performance of the Puerto Rico Electric Power Authority*, Case No: CEPR-IN-2016-0002, November 15, 2016.

PREPA's organization, resource planning, operations, resources acquisition, visibility and transparency, and use of external experts.

I recommend that this new performance proceeding, and any follow-up performance activities, be used to provide additional regulatory oversight to support the rate mechanism established in this rate case.⁴² The performance proceeding and follow-up activities should provide the Commission with much more information than what is typically filed in a rate case, as well as many more opportunities to induce improved budgeting and spending than what is possible in rate case orders.

I recommend that the Commission use the performance proceeding to:

1. Investigate ways to improve the accuracy and efficiency of PREPA's organizational and institutional approach to budgeting and spending.
2. Establish a set of performance metrics and reporting requirements that will allow for more effective oversight by the Commission and the Advisory Board of PREPA's budgeting and spending practices.
3. Investigate employee compensation packages that provide management and other employees with financial rewards and penalties linked to the achievement of PREPA's performance metrics.
4. Investigate opportunities for outsourcing PREPA services or performance areas that routinely under-perform.
5. Investigate opportunities for PREPA's Advisory Board to support PREPA's performance improvement and cost control initiatives.⁴³

I recommend that the rate cases be closely coordinated with the performance proceeding and follow-up activities. The Commission should use the analysis, findings, and metrics from the performance proceedings as inputs to the annual rate review, both for interim rate cases and full rate cases. This information will be useful in establishing sound budget forecasts and inducing PREPA to operate within them.

Report Budget Over-Runs

As noted above, the Commission has limited ability to disallow unreasonable or imprudent costs in the case of a publicly-owned utility such as PREPA. In the absence of shareholders, any disallowance of incurred costs would only serve to harm customers by reducing funds available for future services. In this context, the Commission must apply other mechanisms for controlling costs.

In the context where a commission reviews and approves a utility's budget forecasts, unreasonable or imprudent costs are defined more narrowly than in a context where a utility's budget forecast is not approved. When a commission approves a utility's budget forecast, it

⁴² Follow-up performance activities might include, for example, periodic filing of performance reports, periodic filing of performance metrics established by the Commission, and future audits of specific performance areas.

⁴³ For more information on several of these points, see Michael O'Boyle and Sonia Aggarwal, *Improving Performance in Publicly-Owned Utilities*, America's Power Plan, November 2015. <http://americaspowerplan.com/wp-content/uploads/2015/12/ImprovingPerformancePubliclyOwnedUtilities.pdf>

essentially accepts that the forecast is reasonable and prudent. The decisions regarding which projects to include in the budget and the magnitude of the budget cannot be challenged later as unreasonable or imprudent. However, a commission can challenge costs that exceed the budget forecasts (i.e., cost over-runs).

I recommend that for each rate case (three-year or interim) in which the Commission finds that PREPA has incurred unreasonable cost over-runs, it issue a short report identifying and explaining those over-runs. The Commission would then provide this budget over-run report directly to several parties who have an interest in PREPA's operations and costs, including PREPA's Advisory Board, the Legislature, the Governor, and PREPA's investors. The report would be publicly-available and posted on a prominent location on PREPA's web site home page. The report should also be posted on a prominent location on the Commission's web site.

I recommend that the budget over-run report include any relevant information from the performance proceeding and follow-up activities, described above. The report should include the following elements at a minimum:

1. A summary of the process used by PREPA to forecast the budgets that were exceeded.
2. A summary of the actions PREPA took to contain expenditures within forecasted budgets.
3. A description of actions that PREPA will take to avoid budget over-runs in the future.
4. A description of the departments within PREPA that are responsible for the budget forecasts and the operational and capital expenditures.
5. The names and positions of the PREPA executives and department heads that are responsible for the budget forecasts and the operational and capital expenditures

The budget over-run report would serve three purposes. First, PREPA executives, managers, and employees should be more inclined to prevent unreasonable or imprudent costs if they know that their performance will be presented in a public way. Second, it would provide PREPA and other parties with information and lessons learned regarding how the unreasonable or imprudent costs occurred, as well as recommendations for how PREPA could prevent such costs in the future. Third, the report might provide the Governor, the Legislature, PREPA's investors, and PREPA's Board with information that could inform their future steps to cultivate better performance from PREPA.

Require PREPA to Provide Complete, Up-To-Date, Audited Rate Case Information

Much of the information filed by PREPA in this rate case is incomplete, out-of-date, and has not been audited by an independent auditor.⁴⁴ The lack of complete, trustworthy information in this rate case limits the ability of the Commission to accomplish its goals and to ensure that PREPA's rates are just and reasonable.

⁴⁴ See the expert report of Jeremy Fisher PhD and Ariel Horowitz PhD, and the expert report of Ralph Smith.

The rate mechanism that is ultimately adopted in Puerto Rico—whether my proposal, PREPA’s proposal, or something else—will depend upon PREPA providing the Commission with complete, up-to-date, independently audited information. Without this information the Commission will be severely limited in its ability to induce PREPA to control costs and to ensure just and reasonable rates.

I recommend that in this order the Commission require PREPA to file complete, up-to-date, independently audited data for both the interim rate cases and the three-year rate cases. PREPA should include this information in the initial filing for each rate case.

Obtain Additional Expertise to Review Rate Cases

Witnesses Hemphill, Sanzillo, Kunkle, and I all agree that the Commission must apply strong regulatory oversight of PREPA to protect customers and minimize the potential for unreasonable or imprudent costs. The annual rate review proposed by me and the FRM proposed by Hemphill will require substantial engagement of the Commission in reviewing, modifying, and approving budget forecasts in each year. There is no question that the success of any rate mechanism in Puerto Rico will require considerable resources and expertise at the Commission.

I recommend that the Commission obtain the additional expertise and resources needed to sufficiently review the interim and the three-year rate cases. This should include expertise in legal, economic, financial, and engineering areas.

Rate Design and Revenue Allocation in the Interim Rate Cases

PREPA proposes that rate design and revenue allocation remain unchanged at the time of the interim rate cases. These would be changed only during a full rate case every three years. Under typical circumstances for a typical electric utility, this would be a reasonable approach. However, PREPA is not a typical utility, given that this is its first rate case and there are many rate design and revenue allocation issues that remain unresolved.⁴⁵

I recommend that the Commission have the power to allow modifications to rate designs or revenue allocations between full rate cases on a case-by-case basis, based upon the specific circumstances that may exist at the time. For example, the Commission may find in the current rate case that certain rate design or revenue allocation proposals have shortcomings that cannot be improved in this rate case, but could be improved prior to the next full rate case in 2019. Therefore, I recommend that the Commission preserve the authority to address rate design and revenue allocation issues in the next interim rate case, and in all interim rate cases, until PREPA’s ratemaking process reaches a level of stability acceptable to the Commission.

In each rate case order, the Commission should articulate whether it intends to investigate and potentially modify rate design or revenue allocation issues in the subsequent interim rate case. In so doing, the Commission should explain the issues dictating the need for modifications to rate design or revenue allocation and how PREPA should address those issues.

⁴⁵ For more information on the shortcomings of PREPA’s rate design and revenue allocation proposals, see the Export Report provided by Paul Chernick, November 21, 2016.

Reconciliation of Volumetric and Non-Volumetric Charges

Witness Hemphill recommends that any reconciliation be “implemented across-the-board through equal percentage adjustment in rates. Thus, each 1% decrease in the revenue requirement will cause a ~1% decrease in all base rate charges (volumetric and non-volumetric).”⁴⁶

I recommend that the Commission reject this method of adjusting charges to reflect reconciliations. Instead, customer charges should remain unchanged by reconciliations, and demand charges (\$/kW) should also remain unchanged. Reconciliations should be applied to only the volumetric energy charge or charges.

Customer charges should be designed to include only customer-specific costs, such as metering, billing, and service-drop costs. These customer-specific costs will generally not change as a result of changes in PREPA’s revenue requirements or in sales, the factors that determine the reconciliation amounts. Thus, the reconciliations should not change them.

Similarly, demand charges should be designed to reflect the capacity costs of serving customers during peak periods. These capacity costs will generally not change as a result of changes in PREPA’s revenue requirements or changes in sales. Thus, the reconciliations should not change demand charges.

Witness Hemphill’s proposal would indirectly result in a change to the rate design determined by the Commission in the most recent rate case, without justification for the change. I recommend that the Commission preserve the rate design adopted in the most recent rate case. In the adopted rate design, reconciled costs are applied only to the volumetric energy charge or charges.

2. Reconciliation of New Rates with Provisional Rates

Act 4-2016 and The Commission's Rate Case Filing Rules require the reconciliation of Commission-approved permanent and provisional rates.⁴⁷ In particular:

when issuing a final order establishing permanent rates, the Commission shall order PREPA to adjust its customer's bills in order to credit or collect any difference between (a) the Provisional Rate charged by PREPA during the time period in which such Provisional Rate remained in effect and (b) the permanent rate which the Commission determines should have applied during such time period, so as to ensure that the Provisional Rates were just and reasonable. Such order shall reflect any upward or downward adjustment, effective as of the date the Provisional Rates were established, necessary to ensure the Provisional Rates were just and reasonable.⁴⁸

Witness Hemphill recommends using PREPA’s proposed FRM to accomplish this reconciliation. He recommends that the reconciliation of the provisional rates with the permanent rates established in the current proceeding occur when fiscal year 2017 (FY2017) actual costs are reconciled with those permanent rates, since the provisional rate was in place during FY2017.

⁴⁶ Hemphill Supplemental Direct Testimony, p. 6, lines 109-112.

⁴⁷ Act 4-2016, Section 6A(f). The Commission’s Rate Case Filing Rules at Section 2.02, Request for Provisional Rates.

⁴⁸ The Commission’s Rate Case Filing Rules at Section 2.02, Request for Provisional Rates.

Under witness Hemphill's proposal, this FY2017 reconciliation would take place in the first FRM reconciliation, which would begin in October 2017.⁴⁹

I note that witness Hemphill's recommendation could be adopted even if the Commission were to reject his proposed FRM and accept all of my recommendations for an annual rate review. Both the FRM proposal and the annual rate review proposal allow reconciliation of FY2017 costs at the time of the first annual reconciliation (e.g., the next interim rate case).

There is another option available to the Commission for reconciling the provisional rates with the permanent rates established in this proceeding. The Commission could reconcile these rates in its January 11, 2017 order in the current rate case; that is, reflect the over- or under-recovery in the new rates established in that order.

Implementing the provisional rate reconciliation in the next interim rate case offers an important advantage over implementing the reconciliation in this rate case. In the next interim rate case PREPA and the Commission will have most accurate and complete information available for the period in which the provisional rates were in place.

Implementing the provisional rate reconciliation in the next interim rate case has one disadvantage relative to implementing the reconciliation in this rate case. Using the next interim rate case for this purpose will make customers wait for any credit due to them for the provisional rate reconciliation. Any over-recovery of costs that occurred from July 2016 until the new rates are put in place in 2017 would not be returned to customers until the new rates from the first reconciliation are put in place. This would happen in March 2018, according to Witness Hemphill's proposed schedule.

I recommend that the provisional rate reconciliation be implemented in the next interim rate case. The advantage of having relevant data that is as up-to-date and correct as possible and reconciling all FY2017 costs at once outweighs the disadvantage of requiring customers to wait one more year for refunds from this process.

3. Energy Efficiency Rider

3.1 Introduction

As required by the Commission's rule on Filing Requirements,⁵⁰ PREPA proposes an energy efficiency rider to recover the costs of all expenses related to the implementation of energy efficiency and demand-side management programs by or on behalf of PREPA.⁵¹ The rider would create an Energy Efficiency Charge (EEC) that would recover the costs of energy efficiency programs from all customers on a per kilowatt-hour basis. PREPA proposes that the EEC (in \$/kWh) be calculated as the total cost of energy efficiency programs (in \$) divided by the total gross retail sales (in kWh).

⁴⁹ Hemphill Supplemental Testimony, p. 9, lines 174-178, and p. 10, lines 206-207.

⁵⁰ Puerto Rico Public Utility Commission, *New Regulation on Rate Filing Requirements for the Puerto Rico Electric Power Authority's First Rate Case*, March 28, 2016, Section 2.12(D).

⁵¹ PREPA's 2nd Submission of Material in Compliance with the Commission's Resolution and Order of June 13, 2016, Schedule J-4 REV.

PREPA's proposed energy efficiency rider also includes the following:

1. A recognition that the expenditures for energy efficiency and demand-side management programs need to be financed in advance of the incurrence of costs.
2. The EEC would be filed with the Commission and updated quarterly. A quarterly forecast of expenditures would be developed, and the EEC would be calculated based upon projected program budgets and projected sales for the quarter.
3. Any over-recovery or under-recovery of costs would be fully reconciled through the EEC at the time of the EEC filing.
4. The funds collected would be segregated from PREPA's general revenues. They would be specifically targeted and used for energy efficiency and demand-side management expenses.
5. All customer classes would contribute equally to the energy efficiency program costs by paying the same \$/kWh EEC. A different approach to collecting these costs could be developed in the future, once PREPA has more evidence of how the different classes benefit from energy efficiency programs.

In compliance with the Commission's rule on Filing Requirements, the EE Rider does not include any numbers regarding how much revenues should be recovered from customers when new rates go into effect. PREPA notes that the program budgets have not been determined at this time and implies that the EE Rider will go into effect once they are determined.

The EE Rider filed by PREPA was clearly developed using the FCA Rider as a template. In several instances the Rider refers to the FCA when it should refer to the EEC. The EE Rider filed by PREPA contains some small typos, and at least one internal inconsistency. In addition, one element of the proposed EE Rider does not appear relevant to energy efficiency and demand-side management programs: the accelerate adjustment.

3.2 Key Issues in Designing Energy Efficiency Riders

Energy efficiency program costs can be recovered from customers in a variety of ways, including: recovering costs in base rates, either with or without a reconciliation; and recovery costs through a rider (often called a system benefits charge), either with or without a reconciliation. The majority of U.S. jurisdictions recover energy efficiency costs through some form of system benefits charge, and in many cases the revenues recovered for energy efficiency are reconciled with actual energy efficiency expenditures.⁵²

The Commission's current integrated resource planning regulations require PREPA to "competitively bid for a third-party administrator to plan for and implement the energy efficiency and demand response programs."⁵³ The third-party administrator would be funded

⁵² See, for example, The Edison Foundation, *State Electric Efficiency Regulatory Frameworks*, IEE Report, December 2014.

http://www.edisonfoundation.net/iei/publications/Documents/IEI_stateEEpolicyupdate_1214.pdf

⁵³ Regulation on Integrated Resource Plan for the Puerto Rico Electric Power Authority Chapter III, Article IV, Section 4.01(d).

entirely by PREPA's ratepayers. The EE rider should provide sufficient funding for a third-party administrator when it is established and begins operation.

In designing an energy efficiency rider for Puerto Rico, the Commission should consider the following questions:

1. Will the energy efficiency rider provide timely and predictable recovery of energy efficiency and demand-side management program costs?
2. Will the energy efficiency rider provide sufficient financial stability for the third-party administrator?
3. Will the energy efficiency rider provide sufficient flexibility for the energy efficiency budgets to be modified over time?
4. Will the energy efficiency rider prevent any cash flow problems or other financial constraints on PREPA?
5. Is the energy efficiency rider fair for customers?
6. Will the energy efficiency rider recover sufficient funds to support the energy efficiency and demand-side management programs?

3.3 Conclusions

I conclude that PREPA's proposed energy efficiency rider is an appropriate mechanism for recovering energy efficiency and demand-side management program costs from customers. In sum, the answer to each of the six questions above is essentially "yes."

The two most important elements of the proposed rider are that (a) the energy efficiency and demand-side management funds are not set in base rates; and (b) that the actual costs incurred will be reconciled with the revenues recovered through the EEC. Once program budget amounts are set in base rates, it can be more difficult to modify them over time in response to changing conditions. Energy efficiency program administrators should have the flexibility to respond to changing market conditions and changing demands from customers by modifying program budgets up or down, consistent with the most recent integrated resource planning or energy efficiency plan. Recovering energy efficiency program costs through a rider, as opposed to base rates, provides the greatest amount of flexibility to modify program budgets over time.

Being able to reconcile actual costs with revenues recovered is important for any electric utility, and it is even more important in PREPA's context. If PREPA hires a third-party administrator to implement the energy efficiency and demand-side management program, then that administrator will need to recover all the costs actually incurred through the EEC; there is nowhere else to recover the costs from. The same point holds true if PREPA implements the energy efficiency and demand-side management programs itself rather than hire a third-party administrator. All the funds must come from the EEC, because there is other way to recover them.

The proposed EE rider will provide both PREPA and, if relevant, the third-party administrator with timely and predictable recovery of costs, and therefore provide financial stability to both agencies.

The recovery of all costs using the same \$/kWh charge for all customers is fair to customers. One of the key purposes of energy efficiency is to reduce energy costs, and a \$/kWh charge will recover costs from customers on an energy basis. In other words, customers will contribute to

the EEC in proportion to the energy consumption that they pose on the system. This approach to recovery of energy efficiency costs is commonly applied in other jurisdictions.

The answer to the final question—whether the EEC will recover sufficient funds—will depend upon how the EEC is calculated. Below I make a recommendation for that calculation.

3.4 Recommendations

I recommend that the Commission direct PREPA to file a corrected version of the EE Rider. The corrected version of the EE Rider should correct for all typos, correct for all references to the FCA, and make sure that all of the elements in the rider pertain to energy efficiency and demand-side management programs. The corrected version of the EE Rider should also clarify how net metering energy will be treated in the denominator of the EEC. (The current version of the rider is unclear on this point.) Ideally, PREPA would provide the corrected version to the Commission prior to the hearing date on which this topic is addressed.

I recommend that the Commission order PREPA to file a final version of the EE Rider, along with any compliance filing that is due as a result of this rate case. This final version of the EE Rider would incorporate all of the corrections in the corrected version, as well as any findings that the Commission makes on this topic.

I agree with PREPA's proposal to not include any values in the EE Rider at this time, given that energy efficiency program budgets have not yet been determined. However, I recommend that the EEC begin to include a real charge to begin collecting funds well before funds are needed by the third-party program administrator or PREPA itself. A reasonable amount of funds will need to be available prior to the commencement of energy efficiency programs in order to recover administration and start-up costs. For this purpose, I recommend that the Commission prepare draft energy efficiency program budgets to be included in the EEC in the first quarter following PREPA's release of a competitive bid for a third-party administrator. The Commission will then work with PREPA and interested stakeholders to refine the energy efficiency program budgets, consistent with the IRP regulation.

I recommend that the final version of the EE Rider provide more information on how the total cost of energy efficiency programs will be determined. I recommend adding the following sentence to the rider: "The total cost of energy efficiency programs will be developed by the Commission based upon the most recently-available, Commission-approved Integrated Resource Plan or Energy Efficiency and Demand Response Plan, in accordance with the Commission's IRP regulation."⁵⁴

The denominator for the EEC is currently defined as "total gross retail sales." This raises the issue of how to treat net metering energy in the calculation of the EEC. Should net metering customers be allowed to avoid paying all or some of the EEC, or should they pay for the EEC as if they did not produce electricity generation? I recommend that the final version of the energy efficiency rider treat net metering energy in the manner Mr. Chernick recommends in his expert report.

⁵⁴ Regulation on Integrated Resource Plan for the Puerto Rico Electric Power Authority Chapter III, Article IV, Section 4.01(c).

Attestation

By filing this report, I certify that the information, facts, and analysis provided here is my testimony and, to the best of my knowledge, true and correct.

/s/ Tim Woolf
November 21, 2016

Tim Woolf, Vice President

Synapse Energy Economics | 485 Massachusetts Avenue, Suite 2 | Cambridge, MA 02139 | 617-453-7031
twoolf@synapse-energy.com

PROFESSIONAL EXPERIENCE

Synapse Energy Economics Inc., Cambridge, MA. *Vice President*, 2011 – present.

Provides expert consulting on the economic, regulatory, consumer, environmental, and public policy implications of the electricity and gas industries. The primary focus of work includes technical and economic analyses, electric power system planning, climate change strategies, energy efficiency programs and policies, renewable resources and related policies, power plant performance and economics, air quality, and many related aspects of consumer and environmental protection.

Massachusetts Department of Public Utilities, Boston, MA. *Commissioner*, 2007 – 2011.

Oversaw a significant expansion of clean energy policies as a consequence of the Massachusetts Green Communities Act, including an aggressive expansion of ratepayer-funded energy efficiency programs; the implementation of decoupled rates for electric and gas companies; an update of the DPU energy efficiency guidelines; the promulgation of net metering regulations; review of smart grid pilot programs; and review of long-term contracts for renewable power. Oversaw six rate case proceedings for Massachusetts electric and gas companies. Played an influential role in the development of price responsive demand proposals for the New England wholesale energy market. Served as President of the New England Conference of Public Utility Commissioners from 2009-2010. Served as board member on the Energy Facilities Siting Board from 2007-2010. Served as co-chair of the Steering Committee for the Northeast Energy Efficiency Partnership's Regional Evaluation, Measurement and Verification Forum.

Synapse Energy Economics Inc., Cambridge, MA. *Vice President*, 1997 – 2007.

Tellus Institute, Boston, MA. *Senior Scientist, Manager of Electricity Program*, 1992 – 1997.

Association for the Conservation of Energy, London, England. *Research Director*, 1991 – 1992.

Massachusetts Department of Public Utilities, Boston, MA. *Staff Economist*, 1989 – 1990.

Massachusetts Office of Energy Resources, Boston, MA. *Policy Analyst*, 1987 – 1989.

Energy Systems Research Group, Boston, MA. *Research Associate*, 1983 – 1987.

Union of Concerned Scientists, Cambridge, MA. *Energy Analyst*, 1982-1983.

EDUCATION

Boston University, Boston, MA

Master of Business Administration, 1993

London School of Economics, London, England
Diploma, Economics, 1991

Tufts University, Medford, MA
Bachelor of Science in Mechanical Engineering, 1982

Tufts University, Medford, MA
Bachelor of Arts in English, 1982

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Woolf, T. 2014. "The Resource Value Framework: Reforming Energy Efficiency Cost-Effectiveness Screening." Presentation at the ACEEE Summer Study, August 21, 2014.

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Woolf, T., B. Biewald, and J. Migden-Ostrander. 2013. "NARUC Risk Workshop for Regulators." Presentation at the Mid-Atlantic Conference of Regulatory Utility Commissioners, June 2013.

Woolf, T. 2013. "Energy Efficiency Screening: Accounting for 'Other Program Impacts' & Environmental Compliance Costs." Presentation for Regulatory Assistance Project Webinar, March 2013.

Woolf, T. 2013. "Energy Efficiency: Rates, Bills, Participants, Screening, and More." Presentation at Connecticut Energy Efficiency Workshop, March 2013.

Woolf T. 2013. "Best Practices in Energy Efficiency Program Screening." Presentation for SEE Action Webinar, March 2013.

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Woolf, T. 2012. "Best Practices in Energy Efficiency Program Screening." Presentation for American Council for an Energy-Efficient Economy Webinar, December 2012.

Woolf, T. 2012. "In Pursuit of All Cost-Effective Energy Efficiency." Presentation at Sierra Club Boot Camp, October 2012.

Woolf, T. 2012. "Best Practices in Energy Efficiency Program Screening." Presentation at NARUC Summer Meetings – Energy Efficiency Cost-Effectiveness Breakfast, July 2012.

Woolf, T. 2011. "Energy Efficiency Cost-Effectiveness Tests." Presentation at the Northeast Energy Efficiency Partnerships Annual Meeting, October 2011.

Woolf, T. 2011. "Why Consumer Advocates Should Support Decoupling." Presentation at the 2011 ACEEE National Conference on Energy Efficiency as a Resource, September 2011.

Woolf, T. 2011. "A Regulator's Perspective on Energy Efficiency." Presentation at the Efficiency Maine Symposium *In Pursuit of Maine's Least-Cost Energy*, September 2011.

Woolf, T. 2010. "Bill Impacts of Energy Efficiency Programs: The Importance of Analyzing and Managing Rate and Bill Impacts." Presentation at the Energy in the Northeast Conference, Law Seminar International, September 2010.

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- Woolf, T. 2009. "Price-Responsive Demand in the New England Wholesale Energy Market: Description of NECPUC's Limited Supply-Side Proposal." Presentation at the NEPOOL Markets Committee Meeting, November 2009.
- Woolf, T. 2009. "Demand Response in the New England Wholesale Energy Market: How Much Should We Pay for Demand Resources?" Presentation at the New England Electricity Restructuring Roundtable, October 2009.
- Woolf, T. 2008. "Promoting Demand Resources in Massachusetts: A Regulator's Perspective." Presentation at the Energy Bar Association, Northeast Chapter Meeting, June 2008.
- Woolf, T. 2008. "Turbo-Charging Energy Efficiency in Massachusetts: A DPU Perspective." Presentation at the New England Electricity Restructuring Roundtable, April 2008.
- Woolf T. 2002. "A Renewable Portfolio Standard for New Brunswick." Presentation to the New Brunswick Market Design Committee, January 10, 2002.
- Woolf, T. 2001. "Potential for Wind and Renewable Resource Development in the Midwest." Presentation at WINDPOWER 2001 in Washington DC, June 7, 2001.
- Woolf T. 1999. "Challenges Faced by Clean Generation Resources Under Electricity Restructuring." Presentation at the Symposium on the Changing Electric System in Florida and What it Means for the Environment in Tallahassee, FL, November 1999.
- Woolf, T. 2000. "Generation Information Systems to Support Renewable Portfolio Standards, Generation Performance Standards and Environmental Disclosure." Presentation at the Massachusetts Restructuring Roundtable on behalf of the Union of Concerned Scientists, March 2000.
- Woolf, T. 1998. "New England Tracking System Project: An Electricity Tracking System to Support a Wide Range of Restructuring-Related Policies." Presentation at the Ninth Annual Energy Services Conference and Exposition in Orlando, FL, December 1998.
- Woolf, T. 2000. "Comments of the Citizens Action Coalition of Indiana." Presentation at Workshop on Alternatives to Traditional Generation Resources, June 2000.
- Woolf, T. 1996. "Overview of IRP and Introduction to Electricity Industry Restructuring." Training session provided to the staff of the Delaware Public Service Commission, April 1996.
- Woolf, T. 1995. "Competition and Regulation in the UK Electric Industry." Presentation at the Illinois Commerce Commission's workshop on Restructuring the Electric Industry, August 1995.

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TESTIMONY

New Jersey Board of Public Utilities (Docket No. ER16060524): Direct testimony regarding Rockland Electric Company's proposed advanced metering program. On behalf of the New Jersey Division of Rate Counsel. September 9, 2016.

Colorado Public Utilities Commission (Proceeding No. 16AL-0048E): Answer testimony regarding Public Service Company of Colorado's rate design proposal. On behalf of Energy Outreach Colorado. June 6, 2016.

Georgia Public Service Commission (Docket No. 40161 and Docket No. 40162): Direct testimony regarding the demand-side management programs proposed by Georgia Power Company in its Certification, Decertification, and Amended Demand-Side Management Plan and its 2016 Integrated Resource Plan. On behalf of Sierra Club. May 3, 2016.

Massachusetts Department of Public Utilities (Docket No. 15-155): Joint direct and rebuttal testimony with M. Whited regarding National Grid's rate design proposal. On behalf of Energy Freedom Coalition of America, LLC. March 18, 2016 and April 28, 2016.

Maine Public Utilities Commission (Docket No. 2015-00175): Direct testimony on Efficiency Maine Trust's petition for approval of the Triennial Plan for Fiscal Years 2017-2019. On behalf of the Natural Resources Council of Maine and the Conservation Law Foundation. February 17, 2016.

Nevada Public Utilities Commission (Docket Nos. 15-07041 and 15-07042): Direct testimony on NV Energy's application for approval of a cost of service study and net metering tariffs. On behalf of The Alliance for Solar Choice. October 27, 2015.

New Jersey Board of Public Utilities (Docket No. ER14030250): Direct testimony on Rockland Electric Company's petition for investments in advanced metering infrastructure. On behalf of the New Jersey Division of Rate Counsel. September 4, 2015.

Utah Public Service Commission (Docket No. 14-035-114): Direct, rebuttal, and surrebuttal testimony on the benefit-cost framework for net energy metering. On behalf of Utah Clean Energy, the Alliance for Solar Choice, and Sierra Club. July 30, 2015, September 9, 2015, and September 29, 2015.

Nova Scotia Utility and Review Board (Matter No. M06733): Direct testimony on EfficiencyOne's 2016-2018 demand-side management plan. On behalf of the Nova Scotia Utility and Review Board. June 2, 2015.

Missouri Public Service Commission (Case No. ER-2014-0370): Direct and surrebuttal testimony on the topic of Kansas City Power and Light's rate design proposal. On behalf of Sierra Club. April 16, 2015 and June 5, 2015.

Missouri Public Service Commission (File No. EO-2015-0055): Rebuttal and surrebuttal testimony on the topic of Ameren Missouri's 2016-2018 Energy Efficiency Plan. On behalf of Sierra Club. March 20, 2015 and April 27, 2015.

Florida Public Service Commission (Dockets No. 130199-EI et al.): Direct testimony on the topic of setting goals for increasing the efficiency of energy consumption and increasing the development of demand-side renewable energy systems. On behalf of the Sierra Club. May 19, 2014.

Massachusetts Department of Public Utilities (Docket No. DPU 14-__): Testimony regarding the cost of compliance with the Global Warming Solution Act. On behalf of the Massachusetts Department of Energy Resources and the Department of Environmental Protection. May 16, 2014.

Kentucky Public Service Commission (Case No. 2014-00003): Direct testimony regarding Louisville Gas and Electric Company and Kentucky Utilities Company's proposed 2015-2018 demand-side management and energy efficiency program plan. On behalf of Wallace McMullen and the Sierra Club. April 14, 2014.

Maine Public Utilities Commission (Docket No. 2013-168): Direct and surrebuttal testimony regarding policy issues raised by Central Maine Power's 2014 Alternative Rate Plan, including recovery of capital costs, a Revenue Index Mechanism proposal, and decoupling. On behalf of the Maine Public Advocate Office. December 12, 2013 and March 21, 2014.

Colorado Public Utilities Commission (Docket No. 13A-0686EG): Answer and surrebuttal testimony regarding Public Service Company of Colorado's proposed energy savings goals. On behalf of the Sierra Club. October 16, 2013 and January 21, 2014.

Kentucky Public Service Commission (Case No. 2012-00578): Direct testimony regarding Kentucky Power Company's economic analysis of the Mitchell Generating Station purchase. On behalf of the Sierra Club. April 1, 2013.

Nova Scotia Utility and Review Board (Matter No. M04819): Direct testimony regarding Efficiency Nova Scotia Corporation's Electricity Demand Side Management Plan for 2013 – 2015. On behalf of the Counsel to Nova Scotia Utility and Review Board. May 22, 2012.

Missouri Office of Public Counsel (Docket No. EO-2011-0271): Rebuttal testimony regarding IRP rule compliance. On behalf of the Missouri Office of the Public Counsel. October 28, 2011.

Nova Scotia Utility and Review Board (Matter No. M03669): Direct testimony regarding Efficiency Nova Scotia Corporation's Electricity Demand Side Management Plan for 2012. On behalf of the Counsel to Nova Scotia Utility and Review Board. April 8, 2011.

Rhode Island Public Utilities Commission (Docket No. 3790): Direct testimony regarding National Grid's Gas Energy Efficiency Programs. On behalf of the Division of Public Utilities and Carriers. April 2, 2007.

North Carolina Utilities Commission (Docket E-100, Sub 110): Filed comments with Anna Sommer regarding the Potential for Energy Efficiency Resources to Meet the Demand for Electricity in North Carolina. Synapse Energy Economics on behalf of the Southern Alliance for Clean Energy. February 2007.

Rhode Island Public Utilities Commission (Docket No. 3765): Direct and Surrebuttal testimony regarding National Grid's Renewable Energy Standard Procurement Plan. On behalf of the Division of Public Utilities and Carriers. January 17, 2007 and February 20, 2007.

Minnesota Public Utilities Commission (Docket Nos. CN-05-619 and TR-05-1275): Direct testimony regarding the potential for energy efficiency as an alternative to the proposed Big Stone II coal project. On behalf of the Minnesota Center for Environmental Advocacy, Fresh Energy, Izaak Walton League of America, Wind on the Wires and the Union of Concerned Scientists. November 29, 2006.

Rhode Island Public Utilities Commission (Docket No. 3779): Oral testimony regarding the settlement of Narragansett Electric Company's 2007 Demand-Side Management Programs. On behalf of the Division of Public Utilities and Carriers. November 24, 2006.

Nevada Public Utilities Commission (Docket Nos. 06-04002 & 06-04005): Direct testimony regarding Nevada Power Company's and Sierra Pacific Power Company's Renewable Portfolio Standard Annual Report. On behalf of the Nevada Bureau of Consumer Protection. October 26, 2006

Nevada Public Utilities Commission (Docket No. 06-06051): Direct testimony regarding Nevada Power Company's Demand-Side Management Plan in the 2006 Integrated Resource Plan. On behalf of the Nevada Bureau of Consumer Protection. September 13, 2006.

Nevada Public Utilities Commission (Docket Nos. 06-03038 & 06-04018): Direct testimony regarding the Nevada Power Company's and Sierra Pacific Power Company's Demand-Side Management Plans. On behalf of the Nevada Bureau of Consumer Protection. June 20, 2006.

Nevada Public Utilities Commission (Docket No. 05-10021): Direct testimony regarding the Sierra Pacific Power Company's Gas Demand-Side Management Plan. On behalf of the Nevada Bureau of Consumer Protection. February 22, 2006.

South Dakota Public Utilities Commission (Docket No. EL04-016): Direct testimony regarding the avoided costs of the Java Wind Project. On behalf of the South Dakota Public Utilities Commission Staff. February 18, 2005.

Rhode Island Public Utilities Commission (Docket No. 3635): Oral testimony regarding the settlement of Narragansett Electric Company's 2005 Demand-Side Management Programs. On behalf of the Division of Public Utilities and Carriers. November 29, 2004.

British Columbia Utilities Commission. Direct testimony regarding the Power Smart programs contained in BC Hydro's Revenue Requirement Application 2004/05 and 2005/06. On behalf of the Sierra Club of Canada, BC Chapter. April 20, 2004.

Maryland Public Utilities Commission (Case No. 8973): Oral testimony regarding proposals for the PJM Generation Attributes Tracking System. On behalf of the Maryland Office of People's Counsel. December 3, 2003.

Rhode Island Public Utilities Commission (Docket No. 3463): Oral testimony regarding the settlement of Narragansett Electric Company's 2004 Demand-Side Management Programs. On behalf of the Division of Public Utilities and Carriers. November 21, 2003.

California Public Utilities Commission (Rulemaking 01-10-024): Direct testimony regarding the market price benchmark for the California renewable portfolio standard. On behalf of the Union of Concerned Scientists. April 1, 2003.

Québec Régie de l'énergie (Docket R-3473-01): Direct testimony with Philp Raphals regarding Hydro-Québec's Energy Efficiency Plan: 2003-2006. On behalf of Regroupement national des Conseils régionaux de l'environnement du Québec. February 5, 2003.

Connecticut Department of Public Utility Control (Docket No. 01-10-10): Direct testimony regarding the United Illuminating Company's service quality performance standards in their performance-based ratemaking mechanism. On behalf of the Connecticut Office of Consumer Counsel. April 2, 2002.

Nevada Public Utilities Commission (Docket No. 01-7016): Direct testimony regarding the Nevada Power Company's Demand-Side Management Plan. On behalf of the Bureau of Consumer Protection, Office of the Attorney General. September 26, 2001.

United States Department of Energy (Docket Number-EE-RM-500): Comments with Bruce Biewald, Daniel Allen, David White, and Lucy Johnston of Synapse Energy Economics regarding the Department of Energy's proposed rules for efficiency standards for central air conditioners and heat pumps. On behalf of the Appliance Standards Awareness Project. December 2000.

US Department of Energy (Docket EE-RM-500): Oral testimony at a public hearing on marginal price assumptions for assessing new appliance efficiency standards. On behalf of the Appliance Standards Awareness Project. November 2000.

Connecticut Department of Public Utility Control (Docket No. 99-09-03 Phase II): Direct testimony regarding Connecticut Natural Gas Company's proposed performance-based ratemaking mechanism. On behalf of the Connecticut Office of Consumer Counsel. September 25, 2000.

Mississippi Public Service Commission (Docket No. 96-UA-389): Oral testimony regarding generation pricing and performance-based ratemaking. On behalf of the Mississippi Attorney General. February 16, 2000.

Delaware Public Service Commission (Docket No. 99-328): Direct testimony regarding maintaining electric system reliability. On behalf of Delaware Public Service Commission Staff. February 2, 2000.

Delaware Public Service Commission (Docket No. 99-328): Filed expert report ("Investigation into the July 1999 Outages and General Service Reliability of Delmarva Power & Light Company," jointly authored with J. Duncan Glover and Alexander Kusko). Synapse Energy Economics and Exponent Failure Analysis Associates on behalf the Delaware Public Service Commission Staff. February 1, 2000.

New Hampshire Public Service Commission (Docket No. 99-099 Phase II): Oral testimony regarding standard offer services. On behalf of the Campaign for Ratepayers Rights. January 14, 2000.

West Virginia Public Service Commission (Case No. 98-0452-E-GI): Rebuttal testimony regarding codes of conduct. On behalf of the West Virginia Consumer Advocate Division. July 15, 1999.

West Virginia Public Service Commission (Case No. 98-0452-E-GI): Direct testimony regarding codes of conduct and other measures to protect consumers in a restructured electricity industry. On behalf of the West Virginia Consumer Advocate Division. June 15, 1999.

Public Service Commission of West Virginia (Case No. 98-0452-E-GI): Filed expert report (“Measures to Ensure Fair Competition and Protect Consumers in a Restructured Electricity Industry in West Virginia,” jointly authored with Jean Ann Ramey and Theo MacGregor) in the matter of the General Investigation to determine whether West Virginia should adopt a plan for open access to the electric power supply market and for the development of a deregulation plan. Synapse Energy Economics and MacGregor Energy Consultancy on behalf of the West Virginia Consumer Advocate Division. June 1999.

Massachusetts Department of Telecommunications and Energy (DPU/DTE 97-111): Direct testimony regarding Commonwealth Electric Company’s energy efficiency plan, and the role of municipal aggregators in delivering demand-side management programs. On behalf of Cape and Islands Self-Reliance Corporation. January 1998.

Delaware Public Service Commission (DPSC 97-58): Direct testimony regarding Delmarva Power and Light’s request to merge with Atlantic City Electric. On behalf of Delaware Public Service Commission Staff. May 1997.

Delaware Public Service Commission (DPSC 95-172): Oral testimony regarding Delmarva’s integrated resource plan and DSM programs. On behalf of the Delaware Public Service Commission Staff. May 1996.

Colorado Public Utilities Commission (5A-531EG): Direct testimony regarding the impact of proposed merger on DSM, renewable resources and low-income DSM. On behalf of the Colorado Office of Energy Conservation. April 1996.

Colorado Public Utilities Commission (3I-199EG): Direct testimony regarding the impacts of increased competition on DSM, and recommendations for how to provide utilities with incentives to implement DSM. On behalf of the Colorado Office of Energy Conservation. June 1995.

Colorado Public Utilities Commission (5R-071E): Oral testimony on the Commission's integrated resource planning rules. On behalf of the Colorado Office of Energy Conservation. July 1995.

Colorado Public Utilities Commission (3I-098E): Direct testimony on the Public Service Company of Colorado's DSM programs and integrated resource plans. On behalf of the Colorado Office of Energy Conservation. April 1994.

Delaware Public Service Commission (Docket No. 96-83): Filed comments regarding the Investigation of Restructuring the Electricity Industry in Delaware (Tellus Institute Study No. 96-99). On behalf of the Staff of the Delaware Public Service Commission. November 1996.

Colorado Public Utilities Commission (Docket No. 96Q-313E): Filed comments in response to the Questionnaire on Electricity Industry Restructuring (Tellus Institute Study No. 96-130-A3). On behalf of the Colorado Governor's Office of Energy Conservation. October 1996.

State of Vermont Public Service Board (Docket No. 5854): Filed expert report (Tellus Institute Study No. 95-308) regarding the Investigation into the Restructuring of the Electric Utility Industry in Vermont. On behalf of the Vermont Department of Public Service. March 1996.

Pennsylvania Public Utility Commission (Docket No. I-00940032): Filed comments (Tellus Institute Study No. 95-260) regarding an Investigation into Electric Power Competition. On behalf of The Pennsylvania Office of Consumer Advocate. November 1995.

New Jersey Board of Public Utilities (Docket No. EX94120585Y): Initial and reply comments ("Achieving Efficiency and Equity in the Electricity Industry Through Unbundling and Customer Choice," Tellus Institute Study No. 95-029-A3) regarding an investigation into the future structure of the electric power industry. On behalf of the New Jersey Division of Ratepayer Advocate. September 1995.

Resume dated November 2016